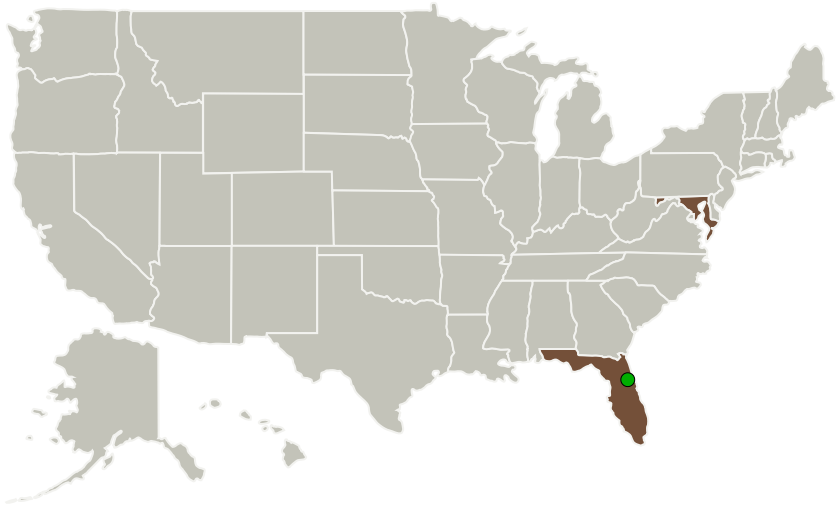
Novel Ultra-Miniature LIDAR Scanner for Launch Range Data Collection, Phase I

Completed Technology Project (2010 - 2010)

Project Introduction

LIDAR (Light Detection and Ranging) technology plays important roles in NASA's space missions. Specifically in KSC's launch vehicles operations, break-through in LIDAR technology could provide ability to economically measure incremental ballistic wind velocities along the predicted trajectory of launch vehicles at remote. The most critical component in a LIDRA is its laser scanner, which delivers laser pulse to target with desirable field of view (FOV). Most of existing LIDARs uses rotating or oscillating mirror for scanning, resulting in several drawbacks: ⍀ Large size of moving parts (mirrors and motors), limiting scanning speed to hundreds HZ; ⍀ Difficult to meet stringent requirements on size, weight, and power for space uses; ⍀ Difficult to control FOV of scanning motion; ⍀ Un-evenness of data point distribution due to inherent acceleration of scanning mirror; ⍀ Waste points at the swath borders of scanning mirror. In this SBIR, we propose a revolutionary LIDAR scanning technology that could eliminate these drawbacks and achieve very high scanning speed, with an ultra-miniature size, much lighter weight and much compact size. This novel technology promises at least a 10x performance improvement in these areas over existing LIDAR scanners. Innovations of the proposed ultra-miniature LIDAR scanner include: ⍀ Ultra miniature size of scanner: it is possible to make the entire scanner in <2 mm in diameter; ⍀ Very high scanning speed (e.g. 5~20 kHz, contrast to several hundred Hz in existing scanners); ⍀ Ideal structure to meet stringent requirements on size, weight, power, and compactness for various space applications; ⍀ The scanning speed and field of view (FOV) can be dynamically adjusted: suited for obtaining high image resolutions of targeted areas and for diversified uses.

Primary U.S. Work Locations and Key Partners



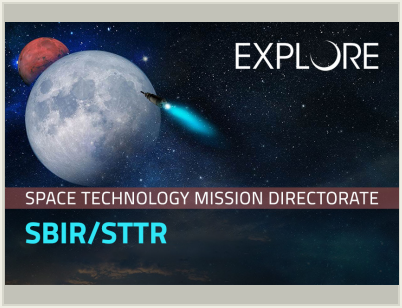


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Table of Contents

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Organizations Performing Work	Role	Type	Location
Xigen, LLC	Lead Organization	Industry	Rockville, Maryland
Kennedy Space Center(KSC)	Supporting Organization	NASA Center	Kennedy Space Center, Florida

Primary U.S. Work Locations	
Florida	Maryland

Project Transitions

January 2010: Project Start

July 2010: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140557)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Xigen, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

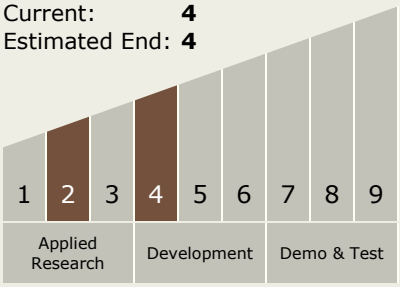
Carlos Torrez

Principal Investigator:

Jason Geng

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.1 Chemical Space Propulsion
    - TX01.1.1 Integrated Systems and Ancillary Technologies

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System